



Chickens dieting to help Delaware's waterways

2:25 p.m., July 31, 2007--Dieting to lose weight and improve your health?

Millions of chickens in Delaware--one of the nation's top poultry producers--have been on a diet to reduce their impact on the environment and improve the health of the state's waterways, and it appears to be working.

Extensive research led by William Saylor, professor of animal and food sciences at the University of Delaware, has confirmed that Delaware chickens now digest more of the phosphorus, an essential nutrient, in their feed, thanks to the addition of a natural enzyme called phytase. As a result, about 23 percent less phosphorus is output in chicken manure.

So now when poultry litter is used to fertilize a farm field, a lot less phosphorus is available to potentially leach from the soil or be carried off in storm water to a river or bay.



Extensive research led by William Saylor, UD professor of animal and food sciences, has confirmed that Delaware chickens now digest more of the phosphorus, an essential nutrient, in their feed, thanks to the addition of a natural enzyme called phytase.

Photo by Kathy F. Atkinson

And that's good news for waterways like Delaware's Inland Bays, where overloads of nutrients, particularly phosphorus and nitrogen, have contributed to serious water-quality problems, such as massive blooms of algae and fish kills.

To put it in perspective, in 2006, Delaware farmers produced over 269 million broiler chickens--1.8 billion pounds of poultry--valued at more than \$739 million, according to the Delmarva Poultry Industry. Those chickens produced more than 280,000 tons of waste.

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According to recent analyses by David Hansen, UD assistant professor of soil and environmental quality, there are now about 19 pounds of phosphorus in a ton of Delaware poultry litter compared to 25 to 30 pounds of phosphorus per ton of litter just five years ago. The 30-40 percent reduction is credited to phytase-modified diets and other nutrient management practices adopted by poultry farmers under Delaware's Nutrient Management Law of 1999. That reduction means that the phosphorus load to the environment has been reduced by some 2 million to 3 million pounds per year.

Addressing a weighty problem

“Phosphorus is essential to all life,” Saylor said. “Livestock, particularly poultry and swine, are fed a diet of seeds and grains. However, two-thirds of the phosphorus in this food is phytic acid or phytate, which is a form of phosphorus that poultry and pigs can't digest, so it goes right through them,” he noted.

“Phytase is an enzyme that is added to poultry feed at the mill that helps broilers and other poultry utilize more indigestible phosphorus,” Saylor said.

Over the past several years, Saylor and colleague J. Thomas Sims, the Thomas A. Baker Professor of Plant and Soil Sciences and associate dean of UD's College of Agriculture and Natural Resources, have led a team of experts in analyzing the nutritional requirements of poultry and swine and the effects of phytase-modified diets on the livestock and the environment as part of a “feed-to-field” approach to nutrient management. The research was funded by an \$821,000 grant from the U.S. Department of Agriculture's Initiatives for Future Agriculture and Food Systems.

The scientific team included poultry nutritionists Roselina Angel from the University of Maryland and Todd Applegate from Purdue University; and Wendy Powers, a swine nutritionist who formerly was at Iowa State University and now is at Michigan State University.

At UD, Saylor and his students formulated various phytase-modified diets for a series of studies involving thousands of broiler chickens. The birds were examined for bone health and growth, as well as the phosphorus content of their manure, beginning as chicks up to market-size birds.

The painstaking research defined the boundary at which the total phosphorus levels in a broiler chicken's corn-soybean meal diet can be reduced without detriment to the birds' health, as well as the percentage of phytase that can be added to the feed to allow the birds to digest more phosphorus, leaving less to literally “go to waste.”

The data have been shared with a nutrient management partnership involving the poultry industry, environmental regulators and the academic community.

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Phytase at 'nucleus' of nutrient management

Millions of chickens in Delaware have been on a diet to reduce their impact on the environment and improve the health of the state's waterways. "It certainly factors into our decision-making process," Dr. Ted Miller, director of nutrition and research at Mountaire Farms Inc., in Selbyville, said of UD's phytase research.

The company has 600 growers across the Eastern Shore, who produce 150 million broiler chickens a year.

Miller serves on an advisory committee in UD's College of Agriculture and Natural Resources and meets regularly with UD and Maryland scientists as an industry cooperator.

"Phytase has been at the nucleus of industry cooperation and regulations to deal with nutrients," William Rohrer Jr., administrator of the Delaware Nutrient Management Program, said. "It has significantly reduced the phosphorus going into our waterways.

"The University's phytase research has provided two critical things," Rohrer noted. "It's brought the science to the table and helped industry take advantage of the enzyme. It's also helped us to quantify the reduction of phosphorus to the environment."

William Vanderwende, chairperson of the state's Nutrient Management Commission, said he has been contacted by several states who want to model their nutrient management program after Delaware's.

While he does not raise poultry, Vanderwende operates a dairy farm near Bridgeville, with 700 dairy cows and 3,000 acres of crops.

"All in all, these phytase diets are doing the job," Vanderwende said. "And I know these scientists are working to see if they can get the phosphorus numbers even lower."

Saylor has been interested in animal nutrition since he was a boy growing up in Butler County, Pa. He "always had animals," including rabbits, sheep and chickens.

After high school, he headed to Penn State, where he received his bachelor's degree in dairy science, master's degree in animal nutrition and then a doctorate in poultry nutrition.

"There are a lot of good people working in poultry to address the phosphorus issue," Saylor said. "Our poultry industry in Delaware is basically surrounded by water, and because of its size and concentration, environmental issues are of great concern," he said.

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“Phytase is definitely a positive piece of the water-quality puzzle,” John Schneider, manager of the Watershed Assessment Section in the Division of Water Resources at the Delaware Department of Natural Resources and Environmental Control, said.

“We are seeing less phosphorus in water samples from all over the state,” Schneider noted. “Clearly, we're doing a lot of things right.”

Article by Tracey Bryant

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